of duration of more than 15 minutes, with the required conditions as to altitude, can be obtained.

If we assume, in fact (which I think will be generally admitted), that no station can be regarded as suitable for Halley's method where the difference between the actual duration and the mean duration is less than half the maximum acceleration or retardation, or where the Sun is less than 10 degrees high at ingress or egress, then absolutely no station whatever is available in 1882, unless the south pole can be approached much nearer even than it was approached by Sir Jas. C. Ross in the famous expedition when Possession Island was discovered.

I confess that the prospect of successful observation at Possession Island, with a Sun only 5° high at ingress, seems to me so slight that I should hear with regret of any attempt to carry out the suggested scheme for wintering at Possession Island in 1882.

Note on the Appearance presented by the Fourth Satellite of Jupiter in Transit in the years 1871–3. By Charles E. Burton, B.A., Exp. Phys. T.C.D.

No. 1. Dec. 30, 1871. IV. when first seen, its distance from the limb of the planet being about one of its own diameters, appeared extremely dark, possibly as dark as when last seen, and approaching mid-transit. I could not satisfy myself that there was any defect of roundness in the dark spot which was once or twice considered to be bordered on its southern side by a bright crescent. The satellite appeared to traverse a bright zone of the planet, and at $12^h \pm$ G.M.T. was in close juxtaposition to the northern boundary of the Antarctic dusky cap. Definition fairly good, a power of 228 being effective at times on a silvered glass Newtonian equatoreal of 7 inches clear aperture.

No. 2. April 8, 1872, $8^h\,45^m$ to $11^h\,5^m$ G.M.T. IV. appeared during the whole time of the observation as a well-defined, almost entirely black spot. When first observed it had accomplished about one-fourth of its transit, and it was watched till three-quarters of its path had been described. During the first half of its observed path it appeared both blacker and also better defined than during the second half, the air being equally good the whole time. The transit took place along (and I believe within) the S. edge of a dark belt.

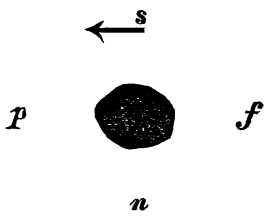
Mr. Erck goes on to say, "My friend Mr. C. Burton drew attention to the fact that the dark spot representing IV. was not round, but decidedly elongated in the direction of the belt during the whole time of observation. In this I concurred."

To this note by Mr. Erck I made one addition; that the following extremity of the elongated dark spot was more acute than the preceding at $11^h\,5^m$ G.M.T. (See *Astronomical Register*,

No. 113, pp. 12–4.) Instrument—the $7\frac{1}{2}$-inch Alvan Clark, O.G. formerly the property of the late Rev. W. R. Dawes, equatoreally mounted and driven by clock. Powers 150 and 400, chiefly the latter.

No. 3. February 4^d 10^h 35^m G.M.T., and for the half-hour following, the shadow of IV. appeared round and black, IV. itself elongated in a direction parallel to that of the belts, and *dark grey*. Instrument, a well-defining achromatic of 3-inch aperture, mounted on table stand and furnished with powers of 112 and 80 diameters. Though the means of observation were in this case so small, yet the presence of the satellite and its shadow on the disk of the planet at the same time gave me great confidence in determining the form of the dark spot on the satellite, which was very distinctly seen.

No. 4. 1873, March 26^d 8^h 5^m ± G.M.T. IV. when first seen had accomplished rather more than two-thirds of its transit and seemed irregular in form, but I should not call it elongated. It was very dark, but several shades lighter than a shadow. The form of the dusky spot at the time given above somewhat resembled that of the spot in the accompanying sketch, a slightly enlarged copy of the same made in my journal at 8^h 55^m to represent the aspect of the satellite at 8^h 15^m± G.M.T. The arrow indicates approximately the *p.* and *f.* direction. Towards 8^h 50^m I repeatedly had the impression that there was a minute bright speck on or very close to the preceding limb of the satellite, but the state of the air at the time precluded the attainment of certainty on this point. (*c. f.* No. 1, and Mr. Roberts' observations in *Monthly Notices* for May for the current year.) Instrument used, a Newtonian equatoreal of 12-inch aperture, with silvered glass mirrors and R.A. driver; the magnifying powers employed being 230 and 408. This telescope leaves nothing to be desired in the way of defining objects of extreme delicacy under powers up to 940.



The late Mr. Dawes, in summing up the results of his observations of III. and IV. in transit (*Monthly Notices*, xx. 246–7) remarks, "I have noticed the *fourth* satellite to be always much the darkest, and though the dark spot is never quite round, yet that it is more nearly so than the third ever is." He goes on to remark upon the deficiency seen by him at the limb of the satellite when it was shining freely on dark sky, and figured in the illustration accompanying his paper quoted above. If the satellite were to pass on to the disk of *Jupiter* while presenting the aspect last mentioned it would evidently be seen as an imperfect and exceedingly dark ring enclosing a dusky shading of much less intensity. I have not been able to find any account of such an appearance; all the records of transits of this satellite which I have examined

stating that the dark spot seen was, if anything, darkest towards its centre, and estimating its magnitude as somewhat less than that of the satellite when seen on a dark ground.

With the above facts my own observations seen to be in perfect accordance. I trust I shall not be considered presumptuous in having made the above statement, as the telescopes made use of in examining the forms of the disks of the satellites invariably show two of them, namely, the second and third, with truly round sharp outlines, free from the slightest trace of scattered light if the air be favourable, under powers of 500 diameters and upwards.

On a review of the whole of the facts in my possession, I incline to an impression that they may be plausibly explained by two assumptions—(1) That the fourth satellite's periods of orbital and axial rotation are identical; (2) That an extensive dusky shading exists on that hemisphere which is turned towards us at the time of inferior conjunction, variable in area and probably also in intensity.

May 22, 1873.

Note on Jupiter, 1873. By E. B. Knobel, Esq.

No account of the physical aspect of *Jupiter* in 1873 having, as far as I am aware, been presented to the Society, I am induced to submit the accompanying three sketches made under favourable circumstances, and which I think are not without interest.

The most striking feature is the great change in the equatorial zone; the port-hole markings, which were conspicuous at the previous opposition, have disappeared, and long, irregular, broken masses, horizontal and inclined at a considerable angle to the equator, have taken their place. The north temperate dark belt, which has been previously depicted as single, is really a double belt, as in the drawings. On April 20th, and May 11th, the south tropical dark belt * appeared thinned out towards the east. The south temperate dark belt has appeared of irregular width, widening towards the west, as in sketch No. 3.

Atmospheric influences this year have been fatal to observations of colour; but on May 11th, definition being remarkably good, the south tropical dark belt was observed of a brick-red tint, more decidedly red than the darker parts of the equatorial zone.

In sketch No. 1, the fourth satellite is represented in transit. An observation of this transit by Mr. Roberts appears in the *Monthly Notices* for April, and therein particulars of the emersion are requested. Having observed the transit and emersion very closely with my $8\frac{1}{2}$-inch reflector, I can only say, in reply to

* The south tropical dark belt is really part of the equatorial zone, but I have given it a distinctive name in consequence of its thinning out, and therefore appearing like a separate belt altogether.